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New direct estimates of Iceland-Scotland Overflow Water transport through the Charlie-Gibbs Fracture Zone and its relationship to the North Atlantic Current

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Detailed observations of the pathways, transports and water properties of dense overflows associated with the Atlantic Meridional Overturning Circulation (AMOC) provide critical benchmarks for climate models and mixing parameterizations. A recent two-year time series from eight moorings offers the first long-term simultaneous observations of the hydrographic properties and transport of Iceland-Scotland Overflow Water (ISOW) flowing westward through the Charlie-Gibbs Fracture Zone (CGFZ), a major deep gap in the Mid-Atlantic Ridge (MAR) connecting the eastern and western basins of the North Atlantic. In addition, current meters up to 500-m depth and satellite altimetry allow us to investigate the overlying North Atlantic Current (NAC) as a source of ISOW transport variability. Using the isohaline 34.94 to define the ISOW layer, the two year mean and standard deviation of ISOW transport was -1.7 $\pm$ 1.5 Sv, compared to -2.4 $\pm$ 3.0 Sv reported by Saunders for a 13-month period in 1988-1989 using the same isohaline. Differences in the two estimates are partly explained by limitations of the Saunders array, but more importantly reflect the strong low-frequency variability in ISOW transport through CGFZ (which includes complete reversals). Both the observations and output from a multi-decadal simulation of the North Atlantic using the Hybrid Coordinate Ocean Model (HYCOM) forced with interannually varying wind and buoyancy fields indicate a strong positive correlation between ISOW transport and the strength of the NAC through the CGFZ. This result raises new questions regarding the interaction of the upper and lower limbs of the AMOC, downstream propagation of ISOW transport variability in the Deep Western Boundary Current and alternative pathways of ISOW across the MAR.